Electronic Version
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Claims

[c1] What is claimed is:

1. A multi-pulse peak-hold deviceutilized to acquire an optical output power level of a laser diode in an optical recording apparatus, the optical recording apparatus having a photodiode for generating a sensed power level signal according to the optical output of the laser diode, the multi-pulse peak-hold device comprising:

a peak-hold circuit comprising a first input for receiving the sensed power level signal, a second input for receiving a reset signal, and an output for a peak voltage signal; and

a sample and hold circuit comprising a first input for receiving the peak voltage signal, a second input for receiving a sample and hold signal, and an output for a held power level signal utilized by the optical recording apparatus to adjust the optical output power of the laser diode;

wherein after a predetermined time period, the optical recording apparatus issues the sample and hold signal causing the sample and hold circuit to sample and hold the peak voltage signal, then the optical recording apparatus issues the reset signal to reinitialize the peak-hold

circuit.

[c2] 2. The multi-pulse peak-hold device of claim 1 further comprising a switch to control transmission of the sensed power level signal from the photodiode diode to the peak-hold circuit according to a window signal issued by the optical recording apparatus.

[c3] 3. The multi-pulse peak-hold device of claim 2 wherein the window signal is issued by the optical recording apparatus to randomly select FPDO sequencesfrom the FPDO pulses train.

[c4] 4. The multi-pulse peak-hold device of claim 2 wherein the window signal is issued by the optical recording apparatus according to a predetermined FPDO sequence comprising fixed data patterns.

[c5] 5. The multi-pulse peak-hold device of claim 1 wherein the peak-hold circuit acquires and outputs a maximum peak voltage occurring in the sensed power level signal within the predetermined time period.

[c6] 6. The multi-pulse peak-hold device of claim 1 wherein the peak-hold circuit acquires and outputs a minimum-bottom voltage occurring in the sensed power level signal within the predetermined time period.

[c7] 7. An optical recording apparatus having automatic power control for adjusting an optical output power level of a laser diode in the optical recording apparatus, the optical recording apparatus comprising:
a control circuit;
a photodiode comprising an output for outputting an optical power level signal;
a peak-hold circuit comprising an output for outputting a peak voltage signal, a first input electrically connected to the output of the photodiode, and a second input electrically connected to the control circuit for receiving a reset signal from the control circuit;
a sample and hold circuit comprising an output, a first input electrically connected to the output of the peak-hold circuit, and a second input electrically connected to the control circuit for receiving a sample and hold signal;
a reference power level setting unit comprising an output for outputting a reference power level signal;
a feedback controller unit comprising an input and an output, the input of the feedback controller unit receiving a difference between the output of the sample and hold circuit and the reference power level signal;
a laser diode driving unit comprising an input electrically connected to the output of the feedback controller unit and an output electrically connected to the laser diode; and

a laser diode for radiating laser light onto an optical disc; wherein after a predetermined time period, the control circuit transmits the sample and hold signal causing the sample and hold circuit to sample and hold the peak signal, the control circuit then transmits the reset signal to reinitialize the peak-hold circuit.

[c8] 8. The optical recording apparatus of claim 7 further comprising a low-pass filter electrically connected between the output of the photodiode and the first input of the peak-hold circuit for alleviating noise effect on the output of the photodiode.

[c9] 9. The optical recording apparatus of claim 7 further comprising a feed-forward path electrically connected between the reference power level setting unit and the feedback controller unit for speeding up transient response from read status to write status in an APC loop.

[c10] 10. The optical recording apparatus of claim 7 further comprising a switch electrically connected between the output of the photodiode and the first input of the peak-hold circuit for controlling transmission of the optical power level signal from the photodiode to the peak-hold circuit according to a window signal transmitted from the control circuit to the switch, wherein the optical power level signal is active to transmit from the photodi-

ode to the peak-hold circuit within the window signal and is inactive outside the window signal.

[c11] 11. The optical recording apparatus of claim 10 wherein the window signal is transmitted to the switch only during a predetermined FPDO sequence comprising fixed recording data patterns.

[c12] 12. The optical recording apparatus of claim 10 wherein the window signal is transmitted to the switch to select random FPDO sequences from the FPDO pulses train.

[c13] 13. The optical recording apparatus of claim 7 wherein the peak-hold circuit acquires and outputs a maximum peak voltage occurring in the optical power level signal within the predetermined time period.

[c14] 14. The optical recording apparatus of claim 7 wherein the peak-hold circuit acquires and outputs a minimum bottom voltage occurring in the optical power level signal within the predetermined time period.

[c15] 15. The optical recording apparatus of claim 7 wherein an output signal from the sample and hold circuit is adjusted by multiplying the output signal from the sample and hold circuit with a proportional constant approximately equal to the inverse of the ratio of measured power to real power, the ratio obtained in an identifica-

tion procedure.

[c16] 16. The optical recording apparatus of claim 7 wherein the reference power level signal is adjusted by multiplying reference power level signal with a proportional constant approximately equal to a ratio of measured power to real power, the ratio obtained in an identification procedure.

[c17] 17. The optical recording apparatus of claim 16 whereinthe input to the feedback control unit is adjusted by multiplying the input to the feedback control unit with a proportional constant approximately equal to the inverse of the ratioobtained in the identification procedure.

[c18] 18. A method for measuring an optical output power level of a laser diode in an optical recording apparatus, the method comprising:
utilizing a photodiode to generate a sensed power level signal according to the optical output of the laser diode;
utilizing a peak-hold circuit to acquire, hold, and output a maximum voltage of the sensed power level signal;
utilizing a sample and hold circuit to sample and hold the output of the peak-hold circuit after a predetermined time period according to a signal received by the sample and hold circuit from the optical recording apparatus; and

reinitializing the peak-hold circuit after the output of the peak-hold circuit has been sampled and held by the sample and hold circuit.

[c19] 19. The method of claim 18 further comprising alleviating noise effects on the output of the photodiode utilizing a low-pass filter between the photodiode and the peak-hold circuit.

[c20] 20. The method of claim 18 further comprising speeding up the transient response from read status to write status in an APC loop by a feed-forward path froma reference power level setting unit to a feedback controller unit.

[c21] 21. The method of claim 18 further comprising controlling transmission of the sensed power level signal from the photodiode diode to the peak-hold circuit with a switch according to a window signal issued by the optical recording apparatus, wherein the sensed power level signal is active to transmit from the photodiode to the peak-hold circuit within the window signal and is inactive outside the window signal.

[c22] 22. The method of claim 21further comprising transmitting the window signal from the optical recording apparatus to the switch to select a random FPDO sequence

from a FPDO pulse train.

[c23] 23. The method of claim 21 further comprising transmitting the window signal from the optical recording apparatus to the switch during a predetermined FPDO sequence comprising fixed recording data patterns.

[c24] 24. The method of claim 18 wherein the peak-hold circuit acquires and outputs a maximum peak voltage occurring in the sensed power level signal within the predetermined time period.

[c25] 25. The method of claim 18 wherein the peak-hold circuit acquires and outputs a minimum bottom voltage occurring in the sensed power level signal within the predetermined time period.

[c26] 26. A method of correcting for a difference between a real optical power output and a measured optical output in an automatic power control structure of an optical recording apparatus, the optical recording apparatus having a photodiode for sensing the optical output power of a laser diode and generating a sensed power level signal, the method comprising:
producing a first recording pulse train of normal writing power for a targeted recording speed from the laser diode of sufficient duration to allow the sensed power

level signal to substantially stabilize;
measuring a first voltage level of the substantially stabilized sensed power level signal;
producing a second recording pulse train of normal writing power for the targeted recording speed from the laser diode of a duration equal to that of a real recording for the write strategy being used;
measuring a second voltage level of the sensed power level signal, the second voltage being approximately equal to a maximum voltage occurring in the sensed power level signal during the second recording pulse train; and
calibrating the automatic power control structure according to the first voltage level and the second voltage level.

[c27] 27. The method of claim 26 wherein calibrating the automatic power control structure comprises multiplying a maximum voltage occurring in the sensed power level signal with a proportional constant approximately equal to the inverse of a ratio of the second voltage level to the first voltage level.

[c28] 28. The method of claim 26 wherein calibrating the automatic power control structure comprises adjusting a reference voltage level by multiplying the reference voltage level with a proportional constant approximately

equal to a ratio of the second voltage level to the first voltage level.

[c29] 29. The method of claim 28 wherein calibrating the automatic power control structure further comprisesadjusting input to a feedback control unit by multiplying the input to the feedback control unit with a proportional constant equal to the inverse of the ratio of the second voltage level to the first voltage level.

[c30] 30. The method of claim 26 further comprising producing the first recording pulse train under a condition of de-focusing the light intensity of the laser diode sufficiently to ensure that the first recording pulse train will not impair an optical storage medium.